The Newsletter of
Engineering Heritage Australia

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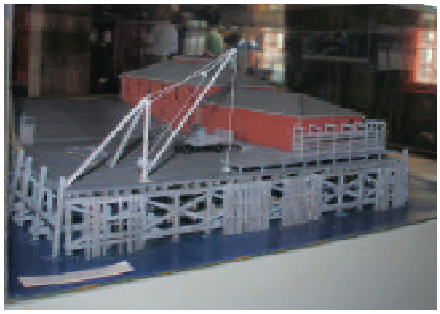
Tathra Wharf

The early settlers of the Bega Valley and surrounding areas would have had an acute sense of isolation prior to the establishment of the trade for local produce. This corner of the State was not to benefit from the building of the State's railway system and, with the relatively late development of the road system, the construction of a wharf was important to the development of the area and was to remain so well into the 20th Century.

The selected site on the northern side of Tathra Head was the only one suitable for a deepwater wharf along the 80 km stretch of coastline from Merimbula north to Bermagui. The wharf opened in 1862 and was gradually enlarged as trade developed and vessels increased in size. Between 1862 and 1913 it became a large rectangle 45 m long, with a face 37 m wide. And an interesting feature of the wharf were the cattle yards and a race for handling of livestock. This feature has been preserved in the restoration of the wharf. The last ship to take freight from Tathra was in November 1954.

National President Julie Hammer with the mayor of Bega Valley, Tony Allen unveiling one of the two plaques



A model of the wharf in its heyday at the exhibition in the conserved wharf building

On 19th January 2008 the National President of Engineers Australia, Julie Hammer, and the Mayor of Bega Valley Shire, Tony Allen, unveiled the plaques at the wharf recognizing the site as a National Engineering Landmark.

The Plaque's Citation:

Tathra is the only open sea timber wharf on Australia's East Coast surviving from the coastal steamer trade era. Critical to development of the far South Coast of NSW, the wharf dates from 1862. With its facilities it was progressively upgraded, remaining in service until 1954. The wharf exhibits techniques in the design and maintenance of heavy timber marine structures of the NSW Public Works Department over the period. It is associated with eminent engineers E O Moriarty and E M de Burgh, and the builder Oakes & Oakes.

The Institution of Engineers Australia, Bega Valley Shire Council, Community of Tathra 2008

'The Longest Fence in the World'

September 30 2007 marked the centenary of the completion of one of the more unusual and remarkable works constructed by the Western Australian Public Works Department (PWD), the Western Australian Rabbit-proof Fence (or more correctly the three Rabbit Proof Fences). They were built for the Government's 'Rabbit Department' which for over 40 years patrolled and maintained what it claimed was 'the longest fence in the world' which ran in an unbroken line 1139 miles from the Pilbara coast to the Bight. The logistics required to overcome the physical difficulties of building a structure stretching from one side of the continent to the other were particularly daunting and marked its construction as a significant engineering achievement.

The three fences, courtesy Wikipedia

Western Australia in the 1890s had plenty of warning that the rabbit invasion was on its way westwards and in 1896 rabbits were found two hundred miles west of the colonial border. After years of indecision the State Government finally decided, in 1901, to build 'protective measures' to keep out the rabbit menace and commissioned one of its most experienced surveyors, Alf Canning, to determine a feasible route for a fence from the south coast near Esperance to Wallal on the north-west coast. Canning and his small party completed the route examination in less than a year despite considerable privations.

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Australia's First Railway Line

In January 2007, the discovery of what appeared to be a section of rail from Australia's first railway line was announced in Newcastle. The find was made by teacher / historian David Campbell. He identified this ugly, rusting piece amongst the debris of a house excavation, as an important relic. His interest was raised by the proximity of this debris to the nearby location of one of Australia's oldest coal mines (the AA Co.'s 'C' Pit in Cooks Hill).

Historian David Campbell displays the section of "fish-belly" rail, believed to be the rail type used in Australia's first railway of 1831 servicing the Australian Agricultural Company's 'A' pit. The photo is taken outside "The Boltons" at the benched site of Australia's first railway on Newcastle's coal-rich 'Hill'

After initial research and identification by David with EHA Newcastle, the rail line section was unveiled at Newcastle's celebrations for the 150th Anniversary of the opening of the Newcastle to Maitland Railway of 1857. It was put on public display in the Heritage Expo held in the Honeysuckle Boilershop by EHA Newcastle and other heritage partners.

Until this time, little was known about the technical details of Australia's first railway. However, Dr Pennie Pemberton, former archivist for the Noel Butlin Archives, had recently researched the Australian Agricultural Co. records to determine that "*..the 'Colliery Equipment'* (for the proposed coal mines of the Australian Agricultural Company) *was shipped from Newcastle-on-Tyne on the Coaster 'Sylph' it was then put aboard the 'Australia'. The 'Australia (Captain William Wilson), a ship of 370 tons, sailed from London on 5 June 1826."* After further stops for livestock & supplies and a stop to revictual at Cape of Good Hope (1 October) and Hobart Town (3-18 December), the ship arrived at Port Jackson on 7 January 1827.

The design of the c.1826 relic surprised many local historians, who assumed that the railway line would have consisted of (the more familiar) long sections of iron rails tied to timber sleepers. David's find showed that this was not the case, and that the AA Co. railway was built using an earlier design of railway line; from short sections of cast, or forged iron. As a result of many breakages of the rails in the very first iron railroads, the rail sections had been strengthened by casting, or forging, in what were called a 'fish belly' shape - preventing breakage under high impact and load stresses. You can see this design in the rail section found at Cooks Hill. A sketch of the rail section is shown above.

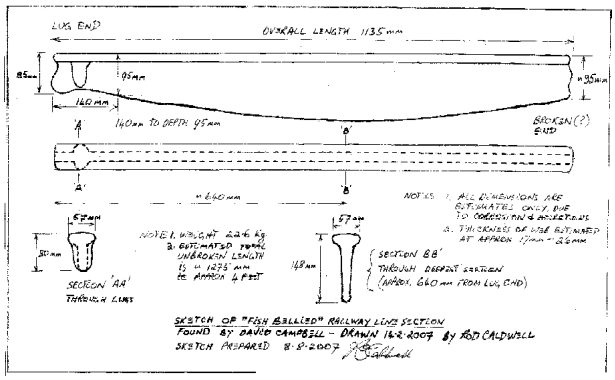
You will observe that the found rail section appears to have one end broken off. The overall length is 1135 mm, but redrawing of the contours with projections from available designs show that the full length may have been 1275 mm. Note that this is confirmed by being very close to 4 foot in length. Available literature suggests that standard rail section lengths of 3 ft and 4 ft were common in the very early rails.

Recent research of archives and inquiries on historians and museums in the UK has been carried out in an attempt to source the provenance of this design of rail section.

Contacted by Light Railways Magazine's Bob McKillop, the Australian discovery was described as an *'extraordinary find'* by railway historian Michael Lewis, author of 'Early Wooden Railways'. Michael sent a photo of some rail sections that he had taken in 1970 at the Newcastle (UK) Discovery Centre. One section is very similar to the relic recently found in Newcastle Australia, (see item on the far left in the photo below). Michael said: *"Like yours, it is 4ft long, it had a vertical rib near each end to locate it in the chair, and it ended in a semi-circular male lug to fit a female socket in the next rail"*

1970 photo of cast-iron rail sections at the Newcastle (UK) Discovery Centre (Michael Lewis)

Michael was able to contact the authorities at this museum, and more relevant information was provided by John Clayson, Keeper of Science and Industry, Tyne & Wear Museums, based at the Discovery Museum, Newcastle upon Tyne. John sent an excited email. First of all he sent measurements which confirmed its weight and size were as close as possible. But he also conveyed some good and bad news:



Sketch of section of rail discover in Newcastle

"First, the good news - we do still have the cast iron rail you photographed in 1970. The less good news is that, at present, we cannot identify any information concerning either where it (the rail section show on the left of the photograph) *was found, or its arrival in our collection……It may be that this Australian find could help us to identify and date our rail!"* So the provenance of the rail is still a mystery, however, we can be confident that it will be in the Newcastle UK vicinity. Fortunately, John says the Museum is willing to work with Australian researchers to identify more information on the two, very similar relics.

These contacts have shown, however, that Australia's first railway line is contemporary with the technologies at the time of the very first railways in Britain. For example, the Stockton to Darlington Railway, renowned as the first passenger railway in the world, first ran in 1825. In fact the other pieces of rail section shown in the above photograph, were identified by the 'Keeper' at the Discovery Centre as "*..cast iron rails of the S&DR type*."

I hope in future to be able to report that our further joint research has identified those places, factories and personalities in the early British rail industry, who played a part in establishing the first coal mine and railway in Australia.

Rod Caldwell

Recognized Engineering Heritage Works

Since our last edition went to press, the following works have been recognized with either a National Engineering Landmark (NEL) or Historical Engineering Marker (HEM).

- *Fish River Water Supply (NEL), Lithgow, NSW* — *September 2008*
- *Bathurst Sewage Treatment Works (NEL)* — *September 2008*
- *Cassilis Hydro-Electric Scheme (HEM), near Omeo, Vic* — *November 2008*
- *Mitchell Freeway Stage 1 (NEL), Perth, WA* — *November 2008*

At its November 2008 meeting, the board of EHA approved the guidelines for the replacement Engineering Heritage Recognition Program in which the two levels of award with be the National Engineering Heritage Landmark (NEHL) and the Engineering Heritage Marker (EHM).

Comparing the View

A regular column by EHA past chair, Keith Baker

Close up of the redundant electrical installation

Earlier this year my wife and I holidayed in Europe, together with a Mediterranean cruise. We visited a number of world heritage and national heritage sites, including ancient Greek, Roman and Egyptian places, as well as medieval and significant twentieth century places. It was very moving to walk on the beach at Anzac Cove, and within twenty-four hours to see the layers of excavation and hear the associated history and myths of ancient Troy. While enjoying the history and beauty of these places, as an engineer I am very sensitive to the way that modern services have been installed at such places to improve access for visitors, and in some cases to enable continuing use of places built many centuries earlier.

Lighting at Corfu Fort. Similar issues exist on the Dubrovnik wall.

I occasionally saw electrical wiring that was reasonably concealed and sensitive to the significance of the place, but more often I witnessed inappropriate, temporary and redundant wiring which detracted from the experience. I may be overly sensitive to such ugliness and poor workmanship, but I don't think it is too much to expect lighting and other electrical equipment to be safely installed, maintained when damaged, and removed when no longer needed. I am not referring to electrical works which have significance in their own right, but lighting, power outlets and fire detection and communications wiring added to allow safe access and use of sites that were built before such services were envisaged.

It is clearly difficult to conceal wiring in stone structures, and some surface wiring is inevitable. But the things I found offensive ranged from insufficient thought about the placement and type of wiring and fittings, to the failure to make provision for services when reconstruction occurs or additions are made for functional reasons.

To give some examples I saw in three world heritage historic sites:

- inexcusable supervision of the replacement of floodlighting at the Great Pyramid of Giza, Egypt, leaving numerous trip hazards for visitors from the exposed mounting bolts and ends of underground cabling from the former lighting;
- flexible cables running unprotected across walkways to fixed floodlights on the wall around the old city of Dubrovnik, Croatia;
- the view greeting visitors on emerging from the entry tunnel to a Venetian fort in Corfu, Greece, of a redundant surface mounted switchboard, energy meters and open wiring.

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Continued from page 1 - The Longest Fence in the World

The major part of the most southerly 465 miles of fence was constructed by contractors. When it was discovered that due to faulty workmanship the rabbits had already penetrated the fence the Government cancelled the contracts and instructed the Public Works Department to take over responsibility for the works. A new branch of the PWD, the Rabbit-proof Fencing Branch, was formed with Richard Anketell, engineer and surveyor, as its Superintendent. His brief was to complete construction of Fence No. 1 and to build a second fence (Fence No.2), approximately parallel to, and 80 miles west of Fence No.1. The new 724 miles long fence ran from the south coast and cut the Kalgoorlie Railway at Cunderdin. Three hundred miles north of Cunderdin it curved round to meet Fence No. 1 at Gum Creek. Fence No. 3 closed the gap between Fence No. 2 and the west coast.

Posts for the fences were made from local jam or mulga wood except for 300 miles of Fence No. 1 where no suitable timber was available and steel pickets had to be used. All the fencing material, stores, provisions and animal fodder weighing an average of 5 tons per mile had to be carted from the nearest port or railway by horse, camel or donkey teams. During 1904-5 over 400 men were employed on the works which progressed at an average rate of 26 miles per month. By June 1905 Fence No. 2 was completed and Fence No. 1 extended to join No.2 at Gum Creek. Work had commenced on the final 531 miles of Fence No. 1 which was by far the most difficult length because of its remote location and poor access.

The main depot for half of the northern section was at the Nannine railhead which was over a hundred miles from the start of the section. Anketell hired every available wagon team in the Ashburton and Gascoyne pastoral areas and also bought camels from local Afghan hauliers. These were still not sufficient so Anketell sent his camel foreman to South Australia to buy a hundred camels which were transported to Nannine by sea and rail. A total of 350 camels, 210 horses and 41 donkeys were fully employed in carting for the project in 1905-06. Most of the large wagons used hauled up to 5 tons with teams of 14 horses or 14 camels.

Work in the north carried on through two cyclone seasons so it was necessary to keep a stock of up to 30 tons of provisions at each work camp in case it was cut off by heavy rains or flooding. These provisions had to be lifted from camp to camp. Four water supply exploration parties established reliable supplies along all three fences at intervals of approximately 12 to 14 miles.

The original northern end at Wallal was not suitable as a fence terminus as the 30ft tide went out several miles, so Anketell relocated it further west on a cliff at Banningarra. A concrete wall was built from the foot of the cliff extending into low water. Three schooners were chartered from Fremantle to take materials direct to Banningarra but, despite Anketell's careful planning, the north-west coast reasserted its dangerous unpredictability. The first schooner took three weeks to reach Banningarra, the second was lost at sea with all hands and the third was wrecked on a reef.

Gates in the fences were built at all road and track intersections at average intervals of eight miles. Flood gates were also constructed at watercourses. For the maintenance workers, boundary riders' cottages and tool sheds, inspectors' houses, stables and stores were built and three large stock depots were established where camels were bred and trained. During the construction of the 2,023 miles (3255 km) of fencing the amount of material and stores transported was estimated to have been in the order of 10,000 tons.

During the 1930s three inspectors and between 12 and 20 boundary riders and station hands were employed on the fences. Each boundary rider patrolled between 100 and 150 miles, covering about ten miles a day, usually travelling in a covered cart drawn by two camels. His duties including mending breakages in the fence, maintaining wells and keeping a fire break on both sides of the fence clear of vegetation. Maintenance of the full lengths of the three fences was abandoned in the 1950s. However, as a continuous fence around the extended agricultural areas was still required, two new fences were built as an Emu Barrier into which parts of the three earlier fences were incorporated.

Richard Hartley

A Peake at Steam

SS *Xantho* and Her Trunk Engine

The *Xantho* was built in 1848 by Denny's Shipyard, Dumbarton (near Glasgow) as an iron paddle steamer for coastal trading. After 23 years operating in coastal waters around Britain, she was purchased by a Glasgow scrap metal dealer. In 1871 he removed her paddle engines and fitted an ex Royal Navy gunboat engine. This engine type has its genesis in a requirement for small gunboats for the Crimean War in the period 1854/55. The engine is a two-cylinder direct acting horizontal trunk engine by John Penn & Sons, Engineers of Greenwich, apparently built in 1858. The ship was also fitted with a new Scotch boiler, new pumps and a three-bladed propeller and thrust block.

The 66 ton *Xantho* was 121 feet overall length with a beam of 17.6 feet and a hold depth of 8.4 feet. She was schooner rigged with the machinery located well aft and the cargo space between the masts.

The ship was sold to Charles E. Broadhurst, a Western Australian entrepreneur who intended to use the *Xantho* in his pearl shell enterprise and for trading along the Western Australian coast. Broadhurst sailed the ship to Australia via the newly completed Suez Canal.

Charles Broadhurst and his wife Eliza were prominent and colourful figures in the colony of Western Australia. Broadhurst was always an entrepreneur and was continually bankrupt and in social disgrace. But the colony needed such men and there must have been many who were sympathetic to his schemes.

The ship was set to work with the hull in very poor condition and on 17 November 1872, just a few months after arriving in Western Australia, the *Xantho,* outbound from Port Gregory, 700 km north of Fremantle with a load of lead ore, sank close inshore in five metres of water.

The wreck of the *Xantho* was discovered in 1979 by divers of the Maritime Archaeological Association of Western Australia acting on a request from the Western Australian Maritime Museum, Fremantle. After discovery of the wreck the project was handed to Dr Michael McCarthy of the Maritime Museum's Department of Marine Archaeology who has continued to manage the *Xantho* project.

In 1984/5 the 7.5 tonnes engine was recovered from the wreck. After initial protection of the engine it was trucked to Fremantle and placed in a chemical bath tank.

Work commenced immediately to preserve the engine and remove huge quantities of concretion attached to it. In the first week of intense activity 1.5 tonnes of concretion were removed. The material was, at this stage, removed by conventional percussive methods so that care had to be taken not to damage the underlying metal.

Brass Oil Cup mounted on steam pipe-work showing the incredible state of preservation of the brass componenets on the engine

Brass and copper pipes and fittings were in good condition, cast iron components, such as the cylinders, were in good condition although corroded whilst wrought iron components were more extensively corroded.

After the initial concretion removal, the tank was filled with a solution of 14 tonnes of sodium hydroxide and sodium bicarbonate to leach chlorides from the metal of the engine by electrolysis. The process of stabilisation was expected to be slow and over the next nine years the tank was periodically drained of its treatment solution so that deconcretion could proceed.

Eventually most of the exterior of the engine was clear of concretion. The only areas not cleaned were the internal parts of the trunks, cylinders and valve chests. A 'direct flame technique' for removal of concretion was developed by the *Xantho* team and after extensive trials was used to clean the internal spaces of the engine.

After the engine was dismantled the process of removing chlorides from the ferrous metals of the engine continued until the museum was confident that the engine materials were stabilised. By 2006 the engine had been re-assembled and placed on public display. Remarkably the engine can now be rotated with a barring lever.

During re-assembly new steel nuts were fitted to replace those removed, which were in a highly corroded condition. Dr McCarthy reports that standard modern Whitworth nuts, purchased locally, were able to be used, and achieved a satisfactory fit in all cases, thanks to the Admiralty insistence on standardisation at the time of manufacture. The *Xantho* engine is therefore not only a remarkable example of marine archaeology but a tribute to Joseph Whitworth's life-long mission to bring proper standards to mechanical engineering.

Xantho engine after re-assembly showing one trunk in place and the other cylinder empty

The *Xantho* is a world-class marine archaeological treasure and the new techniques developed during the *Xantho* project will be applied elsewhere.

I wish to acknowledge the assistance of Dr McCarthy and the Western Australian Maritime Museum in the preparation of an article for the International Stationary Steam Engine Society on which this article is based.

Owen Peake

Continued from page 3 - Comparing the View

And somewhat by contrast, in a nationally significant Venetian fort in Heraklion, Crete, the commendable effort to conceal wiring in mortar joints and to recess lights above the height where visitors would interfere with them. However this was only to be spoilt by the later addition of white plastic sheathed telephone and security wiring run carelessly on the surface.

We often talk about the heritage significance of places, but less about their condition and integrity. Condition refers to the state of repair or deterioration, whilst integrity refers to the authenticity of the fabric and any reconstruction or additions. To my mind, the existence of engineering services, like the examples above, risks reducing severely the condition and integrity of places of great significance.

I think much more needs to be said about the installation of engineering services in a heritage context. So I was pleased to note on our return that the Queensland Heritage Guidelines state: *"Service installation can cause major problems in historic*[sic] *buildings and special care and planning is required to accommodate new services such as fire detection systems and reticulation of power, water and telephone cabling. Services should be discreetly located so as not to impair the character, appearance or integrity of the place. In all cases, the least damaging routes for services should be selected and ad-hoc installations should be eliminated."*

The relationship between condition and integrity is not just an issue for buildings. Sometimes the improvements we make to the condition and serviceability of engineering works can reduce their heritage integrity, but this is a necessary judgement and the subject for another time.

Heritage Marker on "The Track"

Territorians mostly refer to the Stuart Highway as "The Track". The iconic road is more than a highway connecting the far-flung communities of the Outback; it has strong links to the history of the Territory stretching back to the meticulous expeditions of John McDouall Stuart, the epic of the construction of the Overland Telegraph, the desperate days of World War Two and even more recent events like the Solar Car Challenges and the Cannonball Run.

The Chief Minister of the Northern Territory, Paul Henderson, unveiled a Historic Engineering Marker at the gates to the RAAF Base, Darwin on 6 December 2007 to recognize the heritage significance of the Stuart Highway North, built and sealed during World War Two between Alice Springs and Darwin. The fifty guests included Delia Lawrie, Minister for Planning and Infrastructure (with responsibility for roads) and several other dignitaries.

Scraper working on the construction of the Stuart Highway

Ernie Wanka, Director of Roads Network at Department of Planning and Infrastructure had done a great job in organising a magnificent piece of Mount Bundy Granite to mount the bronze plaque on. RAAF personnel were also present including Group Captain Viggers, the then Darwin Base Commander.

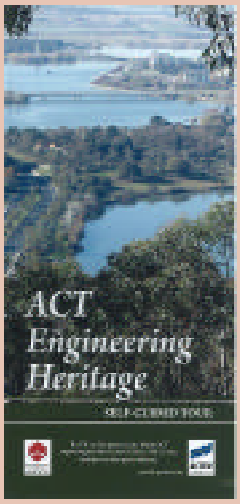
The Stuart Highway North was started in 1940, just before hostilities in the Pacific commenced and work continued throughout the War. By the end of the War the 1500km highway was completed and sealed between Alice Springs and Darwin. Perhaps its greatest strategic importance was that it connected the railheads at Alice Springs and Larrimah thus enabling all-weather transport of troops and materials to the Top End as Allied forces built up to push north through the "Islands". A feature of the construction was the very great speed of building the road whilst the nation was under its greatest threat ever. Most of the resources used were civilians from road authorities around the nation with the assistance of the Australian Army and even one unit of the United States Army. It was a massive effort, done in a great hurry with limited equipment and materials due to the wartime emergency conditions.

The marker was placed in front of the RAAF Gates because the original Stuart Highway alignment happened to go right under the spot and we had to find a site where people could safely pull off the highway to look at the plaque. A nearby shopping centre car park provided a good opportunity.

Discussions are continuing with the Department to place similar plaques in the vicinity of the main towns along the route. We would like to highlight some of the sections of old road which survive as they were originally built. These places are limited and sometimes hard to find but Peter Poole, a long-time Territory roads engineer and the historian for the marking project, has a long list of such sites. Perhaps the best known is a 68 km section called Dorat Road which winds through the hills south of Adelaide River township before it rejoins the Highway. Whilst locals tend to blast straight down the Highway I would recommend the Dorat Road detour to visitors. It runs through some beautiful and rugged escarpment country and the construction is pretty much as it was at the end of World War Two, so it gives a good impression of what the old Stuart Highway North was like.

Owen Peake

Relaunch of ACT Engineering Heritage Self-Guided Tour Brochure



In cold (and snowy!) conditions, Engineering Heritage Canberra (EHC) conducted a most successful relaunch of its Engineering Heritage Self-Drive Tour Brochure on Sunday 10 August 2008. The event was co-hosted by ACTEW Corporation, the ACT Government owned supplier of energy, water and wastewater services to the nation's capital and surrounding regions, and was held at the newly refurbished historic Cotter pumping station. ACTEW Corporation also provided sponsorship funding towards the design and printing of the brochure, for which EHC is most grateful.

The launch was conducted by the President of the Canberra Division of Engineers Australia, Lindsay Evans, and Mark Sullivan, Managing Director of ACTEW Corporation. Past Chair of the National Board of Engineering Heritage Australia, Keith Baker gave the introductory remarks with Lindsay and Mark jointly officiating to launch the brochure before a good crowd of Engineers Australia members, family and invited guests.

The self-guided tour described in the brochure is a 170 km long drive featuring selected heritage engineering sites within the ACT dating from the turn of the late 19th Century. The tour focuses both on engineering sites that have been acknowledged under the EHA 'Heritage Recognition Program' such as the Cotter River Dam Precinct (including the pumping station), Lake Burley Griffin, Tharwa Bridge and the Kingston Power Station, and other sites of engineering significance such as the Canberra Deep Space Communication Complex (Tidbinbilla Space Tracking Station) and the Mt Stromlo (Astronomical) Observatory. The original brochure was produced about 10 years ago, and it was updated to reflect changes to the region's infrastructure, particularly those imposed as a result of the 2003 ACT bushfires.

In his speech Mark Sullivan remarked on the appropriateness of the Cotter Pumping Station as a location to launch the Heritage Self-Guided Tour, as it had played a significant role in providing water to the ACT since its inception in the early 1900's, and even today continues to be an integral part of ACTEW's water supply system. The Cotter Pumping Station had not been used to supply water to the city since the 1960s when the Bendora gravity water main was commissioned. However, following the recent bushfires and serious drought it has been progressively re-commissioned since 2004. The re-commissioning has meant the region again has access to water from the Cotter Reservoir, as well as being able to source water from the Murrumbidgee River.

The launch of the ACT Engineering Heritage Self-Guided Tour Brochure marked the end of Engineering Week celebrations in the national capital. A copy of the tour brochure will be available soon on the EHC website, www.engineer.org.au. This website also features an online version of the book *"Canberra's Engineering Heritage"* which covers many diverse engineering fields such as roads, bridges, electrical power, and water supply for the nation's capital. Its fourteen chapters were written by acknowledged experts in their field and provide an excellent resource for school projects or visitors wanting to know more about how the nation's capital was created.

2008 John Monash Medal for Carl & Margret Doring

Engineering Heritage Australia has awarded the 2008 John Monash Medal for Engineering Heritage to husband and wife engineers Carl & Margret Doring.

This annual award is made for an outstanding contribution to the conservation of engineering heritage over a considerable period of time.

Around 1980 Margret, a civil / structural engineer, set out on a successful campaign to change the construction industry's attitude to heritage conservation and to restore the neglected Queen Victoria Building in Sydney.

Carl and Margret at the medal presentation with National President Julie Hammer

Mechanical engineer Carl's first industrial archaeology commission was the recording of Toohey's Brewery Malthouse in 1985. Although the original equipment had gone, he succeeded in reconstructing the process and machines on paper. Recording the former Tramway Workshops in Randwick, due for demolition and redevelopment, followed.

Working in the Heritage Branch of the NSW Government, Margret and Meredith Hutton battled long and hard to prevent damage to the heritage values of the Great North Road in NSW, caused by upgrading works and 4WD vehicles, eventually getting the road closed to all motor vehicles.

Another struggle saved the 1875 Echuca Road / Rail Bridge from demolition, where Margret was heavily involved in writing the original report, ministerial briefing notes, press releases, reports to the Heritage Council, assessment of an EIS, with both the NSW and Victorian governments involved.

Altogether Carl and Margret have participated in 47 industrial archaeological projects, including the huge 1908 Dowling Street Tram Depot in Sydney (since demolished); the vast Newport Railway Workshops in Melbourne, the Conservaton and Management Plan for the Honeysuckle Point Railway Workshops and Lee Wharves in Newcastle, and a heritage assessment and inventory of more than 600 significant items at the Midland Railway Workshops in Perth. Other studies involved the Eldorado Dredge, the Albury Woolstores, the Bushell's Tea Factory and Woronora Dam.

For the Walsh Bay finger wharves which were being redeveloped in Sydney, Margret wrote stronger conservation guidelines when the existing ones were ignored or inadequate. The Wooloomooloo Finger Wharf faced demolition until Margret prepared a new heritage assessment and comprehensive conservation guidelines; redevelopment has been successful and the wharf is still there.

When the Sydney Water Board was concerned that the roof of the Crown Street Reservoir might collapse, Carl's research for his heritage assessment showed that the strength of the cast iron beams was more than adequate and he devised a method of repairing the ironbark columns without detracting from their heritage significance.

Carl & Margret have made many voluntary contributions through their often long term memberships of Australia ICOMOS, National Trust committees, the Society for Industrial Archaeology and EA's Sydney Engineering Heritage Committee.

Approaching retirement and aware of the great mass of engineering heritage research that they have accumulated, the Dorings have embarked on a program of republishing and cataloguing their reports for lodgement, usually in digital form, with libraries and institutions around Australia.

Bruce Cole, Convenor, John Monash Medal Committee

Historic Engineering Marker for Lake Margaret Power Scheme

On Saturday 23 February 2008, Engineers Australia presented a Historic Engineering Marker to Hydro Tasmania for the Lake Margaret Power Scheme near Queenstown.

The scheme was built by the Mt Lyell Mining & Railway Company in 1914 to eliminate the increasingly high cost of firewood for its steam-driven power station, then consuming 2,000 tonnes per week.

A concrete dam on the Yolande River diverted the flow into a 2.2 km long wood-stave pipeline. The water then fell 340 metres to the station in two steel penstocks which initially housed four 1.2 MW turbines and generators. A 10 km long transmission line delivered power at 6.6 kV to the mine and to Queenstown.

All the materials and equipment for the construction of the scheme were carried on the Abt Railway from Strahan to Queenstown and then by 2 ft tramway to the site. The steep climb to the power station site included a zig zag section where the wagons had to reverse twice. Many construction workers came from Malta to work on the scheme. A village was built near the station to house the construction workers and subsequently, the operators.

Several expansions followed. By 1931 the station had seven machines and a lower station of 2 MW had been built. Until 1937 the Lake Margaret scheme was the sole supplier of electricity to the West Coast towns. The tramway provided the only access until 1964 when a road replaced it.

Guests at the plaque unveiling inspect a section of the original wood-stave pipe

Hydro Tasmania purchased the scheme in 1985, mothballed the lower station in 1994 and closed the upper station in 2006 for safety reasons. The station still houses its original machines and equipment under care and maintenance.

Closure attracted public opposition and the West Coast Council initially refused permission to demolish the woodstave pipeline, a decision overturned on appeal. Three sections of pipeline have been retained for public viewing. A Lake Margaret Consultative Committee has been meeting to provide input to re-development studies.

Over 60 people attended the Award ceremony held in the Queenstown RSL. The Governor gave an address on the development of hydro power in Tasmania, Phil Mathers outlined the history of the Lake Margaret scheme, while National President Julie Hammer described its heritage significance and presented the Marker. She and the Governor unveiled the Marker which was accepted by Hydro CEO Vince Hawksworth who indicated that refurbishment of the scheme is the preferred option and that a decision on the future of the scheme is due to be made later this year.

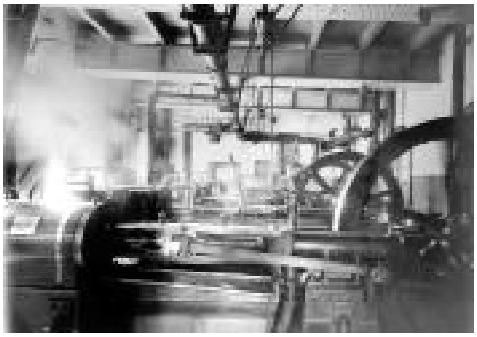
After an enjoyable lunch, three minibuses conveyed the attendees to the Lake Margaret area for a tour of the power station, a walk around the village and a view of the impressive sight of the steeply descending pipelines. A week of fine warm weather ceased abruptly the moment we arrived in Queenstown but, fortunately, intermittent heavy showers mostly held off during the tour so that the inspections were not restricted by the weather.

The whole event was very successful. Hydro Tasmania provided the ceremony venue, the lunch, the minibuses and a wonderful display of historic photographs.

Bruce Cole - Chair, Engineering Heritage Tasmania

The Melbourne Hydraulic Power Company and Public Hydraulic Power Systems in Australia

In July 1889 the Melbourne Hydraulic Power Company (MHPC) commenced operation as a motive power utility serving the then central business district of Melbourne. The scheme was based on a steam powered pumping station located at Australian Wharf with underground cast-iron mains conveying water at a nominal pressure of 700 psi (4.8 MPa) for use by customers for the operation of hydraulic lifts, hoists, cranes, wool presses and other motive plant.



The Melbourne Hydraulic Power Company's No. 1 engine room

Public hydraulic power was first implemented in Hull (UK) in 1876, followed by London in 1883 and Liverpool in 1885 (not forgetting the system established in 1878 in Newcastle, NSW, for coal loading cranes – Ed.). In 1885, John Coates from the London family firm, John Coates & Co. founded a branch office of the industrial engineering business in Melbourne. During Melbourne's 1880s boom period, Coates saw the business opportunity to establish a hydraulic power utility for the city, particularly to power goods and passenger lifts in the multi-storey buildings then coming into favour. In 1886 he invited his then 26 years old engineer nephew, George Swinburne, to join him in setting up a Melbourne scheme. As had been the case in the UK, an act of parliament was necessary to enable opening of the streets to lay the hydraulic mains and to charge customers for the motive power service. The Melbourne Hydraulic Power Company Act was passed, after protracted debate and deferrals, in December 1887. A period of rapid construction by the MHPC, with Swinburne as engineer-manager and Coates & Co. as consulting engineers, ensued. The steam operated pumping plant was supplied by Abbot & Co. (UK) and went into service $1^{1}/_{2}$ years later.

The Melbourne hydraulic power utility was an immediate success. By the end of 1889, some seventy hydraulic lifts had been connected to the system along with other hydraulically operated equipment. Within ten months from the commencement, a third pumping engine rated at 450 gpm (34 L / s) was installed to more than double the capacity. At the end of 1891 one hundred customers were connected and a fourth and larger pumping engine was added. The initial CBD area served by the high-pressure mains was bordered by Lonsdale, Russell, Flinders and Spencer Streets. By 1897 there was more than 16 miles (26 km) of mainly 4" (100 mm) and 6'' (150 mm) mains serving the city, with branches into some nearby suburbs. Customers paid for the service by a combination of a connection fee and the metered volume of water used. Water was initially drawn from the Yarra River adjacent to the city but from 1893 it utilized the Public Works Department constructed supply from Dight's falls in Kew.

Despite the 'bust' and economic recession in the 1890s, the MHPC continued to prosper and by 1900 consumer water demand was again stretching capacity. This was addressed in 1901 with a second steam pumping station, this time within the CBD where Melbourne Central is now located. From early in the twentieth century competition from electricity for motive power applications started to bite, nevertheless from a peak year in 1902 when 102 million gallons (454 ML) was sold, the company's service was still much in demand in 1925 when its assets reverted to Council ownership in accordance with a provision of the enabling legislation. In 1928 the Melbourne City Council consolidated the system with new electrically driven multi-stage centrifugal pumps at its Spencer Street power station and retired the former steam pumping stations. New customers were connected early in the Council's tenure and the system remained in service until December 1967. Aside from the disused CI pipes under the streets and a few customer installation items, little now remains of this once preeminent power service utility.

The early success of the MHPC led to the establishment of the Sydney & Suburbs Hydraulic Company (later SHPC) initially by mainly the same Melbourne-based investors. Starting in 1891, it was the fifth of ultimately eight such public utilities in the world. The Sydney system had its main steam – later converted to electric – pumping station in Darling Harbour in a building that is now used as a tavern.

The Sydney scheme, which remained as a private company throughout, finally closed down in 1975 after 82 years of service. The closure one year later of the once very large London scheme brought to an end 100 years of public hydraulic power services. That public hydraulic power systems once established lasted so long is a testament to the sound Victoria-era engineering they embodied and the entrepreneurial spirit of the original promoters.

Miles Pierce

A fully referenced heritage paper by Miles Pierce on the above subject was published earlier this year in the on-line version of the Australian Journal of Mechanical Engineering and will appear in the next hard-copy issue of the Journal late this year or early 2009.

Port Arthur Lime Kiln

Your article on Walkerville Lime Kilns (EHA Newsletter No 20 May 2008) reminded me of a kiln I saw at the Dockyard site at Port Arthur, Tasmania. Unfortunately there is no interpretive sign at the kiln to indicate what the relic is - even the staff were unaware, although able to produce the reference.

The Port Arthur lime kiln (identified as such in ref. 1) is in good condition (see photo): the external dimensions are square but as viewed from the top, the internal dimension is cylindrical. The kiln differs from the Walkerville kiln in size and height: it is missing the bell-shaped portion (mentioned also in ref. 1).

Whilst located in the Dockyard, the kiln was actually constructed in 1854 after the Dockyard's closure and was in use until 1874. Thus this kiln is older than those at Walkerville. The lime kiln generated lime for mortar and plaster used to maintain the large number of buildings at Port Arthur as well as for fertiliser (ref.1).

Matti Keentok

Port Arthur lime kiln, viewed from below

Reference 1. Port Arthur's Dockyard 1834-1848 (booklet), Port Arthur Historic Site, no date.

EHA Is Not Alone!

The Newsletters of the UK Institution of Civil Engineers Panel for Historical Engineering Works (PHEW) and the Newcomen Society "Links" continue to present a broad and interesting range of engineering heritage subjects.

The March 2008 edition of "Links" is a good example of the range of topics. Amongst others, it contained an article on a Newcomen Society visit to the British Airways Museum at Heathrow which includes material from the very early days of aviation in the UK up to and beyond the Concorde. Another site visit described was to Westinghouse Rail Systems, a company with over 140 years of experience producing innovative products for the railway industry. Railway signalling is a major part of Westinghouse's work and the visit tracked the development from the early mechanical signalling systems to modern electronic systems. The ICE North Eastern Branch reported on lectures about the restoration of the Gateshead High Level Bridge, completed in 1850 and still in service. The bridge consists of six spans of double decked structure catering for both road and rail traffic. Surprisingly, this bridge is primarily constructed of cast iron. There is an article on the Liberty Ships built during World War II in American shipyards to a British design. The ships were designed to be riveted but in practice they were primarily electric welded leading to a number of metallurgical challenges. The article includes a history of the *SS Jeremiah O'Brien*, a Liberty Ship built in 1943 and preserved in San Francisco. In 1994 she made the 20,000 mile round trip to be present at the commemorations of the 50th anniversary of the D-Day Landings in 1944. Of the 7000 odd ships at D-Day the *Jeremiah O'Brien* was the only one to return fifty years later. An ICE meeting in Birmingham featured a lecture about the early plastics industry in the area. The Bakelite Company which was an early leader in the thermosetting plastics industry had its factory at Tyseley in Birmingham.

The PHEW Newsletter (December 2007) contained a detailed report on the Historic Bridge and Infrastructure Awards 2007. The awards went to a total of nine projects, seven bridges, a canal tunnel and a staircase of canal locks. The latter part of this newsletter contains the "HEWs in the News" column which relates events, reports and developments in relation to any of the Historical Engineering Works (HEWs) recognized and marked by ICE. This particular edition contained sixteen entries covering about two pages. The feature is very valuable and could provide a useful model for the EHA Newsletter.

Owen Peake

Awarding Merit

The Awards of Merit for Engineering Heritage shows appreciation to members of Engineering Heritage Australia committees and groups and their supporters and collaborators. It recognizes significant contributions to engineering heritage. Two further awards are described in this article.

Dr Donald John Fraser was a founding member of the Sydney Engineering Heritage Committee when it was established in 1978. For some years he was the Sydney representative on the National Panel on Engineering Heritage and was its chairman in 1983 and 1984.

Don is best known as a bridge expert, however the sheer quantity and quality of the work he has undertaken is arguably unsurpassed. Don has researched and written a large proportion of the Sydney Committee's plaquing nominations, has written nominations for other heritage groups, and has worked to ensure that plaquing ceremonies ran smoothly.

Don has presented many papers on engineering heritage to conferences in Australia and overseas and has published extensively. Three papers published in 1985 are still referenced: *Moveable Span Bridges in New South Wales Prior to 1915, Early Reinforced Concrete in New South Wales (1895-1915)* and *Timber Bridges of New South Wales*. For these he was awarded the Institution's Monash Medal for the best paper on engineering.

Don has also been involved in several book projects. He edited *Sydney - From Settlement to City* and authored three chapters. With historian Dr Lenore Coltheart, Don edited and compiled *Landmarks in Public Works*. The Australian Railway Historical Society published his book *Bridges Down Under – the history of railway underbridges in NSW*.

Bill Patterson has been an active member of the Queensland Mechanical Engineering Branch Committee and was recruited to the Queensland Heritage Panel in 1983. Bill was an active Panel Secretary from 1983 until 1995. Between 1995 and 2004 Bill was the Deputy Chair of the Panel. During 20 years on the Panel Bill eased the load of four Chairs and always enthusiastically promoted Engineering Heritage.

Bill helped with the organisation for the First National Conference on Engineering Heritage which was held in Brisbane in 1982. He was also a member of the editorial committee which published *Eminent Queensland Engineers Volume 1* in 1984.

Bill was active in the archiving group of the Queensland Heritage Panel and had a particular interest in collecting historical engineering videos. He catalogued the Division's collection of about 250 cassettes, and for many years he presented video nights as part of the Panel's program.

Enquiries about the Award of Merit can be made to the Administrator, Engineering Heritage Australia, phone (02) 6270 6525.

Owen Peake

Third Australasian Engineering Heritage Conference

Dunedin New Zealand
22 to 25 November 2009

"Engineering in the Development of a Region – Heritage and History" is the theme of next year's conference at the University of Otago in Dunedin.

Conference themes and topics include Agricultural Development, Power, Transport and Communications, Resource Extraction, and The People.

A pre-conference tour will take in a range of interesting engineering heritage places in southern NZ and a few tourist spots. It's likely to include the harbour and sites of early frozen meat export history, the Waitaki valley and hydro-electric power stations and, at Queenstown, the lake steamer TSS Earnslaw.

Further information will be available as conference planning proceeds.

Refer to IPENZ Engineering Heritage website: www.ipenz.org.nz/heritage, or Contact: Lloyd Smith, Chairman IPENZ Engineering Heritage Otago Chapter, 64 Ann Street, Roslyn, Dunedin 9010, New Zealand. Email: EHConference09@ipenz.org.nz

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